

CLAIMS

What is claimed is:

1. A printing structure comprising:

a silicon substrate; and

5 a plurality of thin film layers formed over a top surface of said silicon substrate, said thin film layers including ink ejection elements;

10 said silicon substrate having etched ink feed channels leading from a backside of said silicon substrate to said top surface, said ink feed channels including at least one first opening leading from said backside of said substrate and through a first thickness of said substrate, said ink feed channels also including at least one second opening through a remaining second thickness of said substrate, said ink ejection elements overlying a layer of silicon of said second thickness substantially thinner than said first thickness.

- 15 2. The device of Claim 1 further comprising:

an orifice layer formed over said thin film layers, said orifice layer defining a plurality of ink ejection chambers, each chamber having within it an ink ejection element, said orifice layer further defining a nozzle for each ink ejection chamber.

- 20 3. The device of Claim 2 wherein said orifice layer is a photoimageable layer

formed as an integral part of said printhead.

4. The device of Claim 1 wherein said ink ejection elements are heater resistors.

25 5. The device of Claim 1 wherein said ink ejection elements reside over said substrate of said first thickness as well as over said silicon of said second thickness.

30 6. The device of Claim 1 wherein said ink ejection elements reside on a silicon bridge of said second thickness between two portions of silicon of said first thickness, such that said ink ejection elements do not overlie said silicon of said first thickness.

7. The device of Claim 1 wherein said at least one first opening in said substrate of said first thickness forms a trench etched in said silicon substrate.

8. The device of Claim 7 wherein said trench extends at least a length of a row of said ink ejection elements.

9. The device of Claim 1 further comprising an ink manifold in fluid communication with said ink feed channels for delivering ink to said ink ejection elements.

10. The device of Claim 1 wherein said silicon substrate comprises a silicon-on-insulator (SOI) substrate having a first substrate portion, an oxide layer over said first substrate portion, and a second substrate portion, said first substrate portion being thicker than said second substrate portion, said substrate of said first thickness being said first substrate portion, and said silicon of said second thickness being said second substrate portion.

11. The device of Claim 1 further comprising a printer housing said substrate.

12. The device of Claim 1 further comprising ink being provided to said at least one opening.

13. The device of Claim 1 further comprising a print cartridge body housing said substrate.

14. A method of forming a printhead comprising:
providing a printhead substrate;
forming a plurality of thin film layers on a first surface of said substrate, at least one of said layers forming a plurality of ink ejection elements;
forming ink feed holes through said thin film layers; and
forming at least one opening in said substrate providing an ink path from a second surface of said substrate, through said substrate, and to said ink feed holes formed in said thin film layers, wherein said plurality of ink ejection elements reside over a silicon layer.

15. The method of Claim 14 further comprising:

forming an orifice layer over said thin film layers, said orifice layer defining a plurality of ink ejection chambers, each chamber having within it an ink ejection element, said orifice layer further defining a nozzle for each ink ejection chamber.

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16. The method of Claim 14 wherein said ink ejection elements reside on a silicon bridge between two portions of thicker silicon.

17. The method of Claim 14 wherein said forming at least one opening comprises
10 etching a trench in said silicon substrate.

18. The method of Claim 17 wherein said trench extends at least a length of a row of said ink ejection elements.

15 19. The method of Claim 14 wherein said printhead substrate is a silicon-on-insulator (SOI) substrate comprising a first silicon layer, a thinner second silicon layer, and an oxide layer between said first silicon layer and said second silicon layer, and said step of forming at least one opening in said substrate comprises:

20 (a) etching said first silicon layer of said SOI substrate using a wet etch to etch a trench in said first silicon layer extending to said oxide layer;

(b) etching at least one opening in said oxide layer; and

(c) etching at least one opening in said second silicon layer to form an ink path between a backside of said SOI substrate and a topside of said SOI substrate.

25 20. The method of Claim 19 wherein said etching step (c) is performed using a wet etch.

21. The method of Claim 19 wherein said etching step (c) is performed using a dry etch.

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22. The method of Claim 14 wherein said step of forming at least one opening in said substrate comprises:

wet etching a backside of said substrate to form a trench, leaving said silicon layer below said ink ejection elements; and
dry etching ink feed holes in said silicon layer.

5 23. The method of Claim 22 wherein said dry etching is performed by masking a
topside of said substrate and dry etching from said topside through to said trench.

24. A method of printing comprising:

10 feeding ink through at least one opening in a printhead substrate and through ink
feed holes formed through thin film layers on said substrate, at least one of said thin film
layers forming a plurality of ink ejection elements, said ink ejection elements residing
over a silicon membrane; and

energizing said ink ejection elements to expel ink through associated nozzles.

15 25. The method of Claim 24 further comprising flowing said ink into at least one
manifold after flowing said ink through said ink feed holes.

26. The method of Claim 24 further comprising flowing said ink directly into ink
ejection chambers after exiting said ink feed holes.